A CASE CONTROL STUDY OF NEUROLOGICAL SOFT SIGNS IN FIRST EPISODE PSYCHOSIS

DISSERTATION

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CERTIFICATE

This is to certify that this dissertation entitled **"A case control study of Neurological Soft Signs in First Episode Psychosis"** is the bonafide original work of **Dr.S. SUKUMAR,** in partial fulfilment of the requirement for **MD (Branch XVIII) Psychiatry** examination of the Tamil Nadu Dr.MGR Medical University to be held in March 2007.

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DECLARATION

I, **Dr. S. SUKUMAR** solemnly declare that this dissertation "**A CASE CONTROL STUDY OF NEUROLOGICAL SOFT SIGNS IN FIRST EPISODE PSYCHOSIS"** is a bonafide record of work done by me in the Department of Psychiatry, Government Stanley Medical College and Hospital, Chennai under the guidance of **Prof. Dr.M.Thirunavukarasu,** Head of the Department, Department of Psychiatry. Government Stanley Medical College and Hospital, Chennai – 600 001.

This dissertation is submitted to the Tamilnadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the University regulations for the award of MD Degree (Psychiatry) Branch – XVIII, Psychiatry Examination to be held in March 2007.

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CONTENTS

INTRODUCTION

Abnormal signs in neurology have traditionally been assumed to be highly informative about the nature and location of disease once the significance of these signs is understood. There is no reason to assume that this is different in case of psychiatric disorders which are also revolves and evolves from neuronal system with its unique differences.

Classic descriptions of the psychiatric disorders often included neurological exam findings. Thus, “insane temperament,” “hysteria”, schizophrenia, mood disorders and obsessive – compulsive disorders were each thought to have characteristic neurologic exam abnormalities **(Sanders & Keshavan, 1998).**

Neurological signs are traditionally classified into “Hard” and “Soft” signs. Soft signs are defined as minor, non localizable, objective abnormalities that are thought to reflect damage in connections between subcortical and cortical areas or between cortical areas. In contrast, hard neurological signs can be linked to specific areas of neuroanatomical damage **(Barkus et al 2006).** Neurological signs are more prominent in patients with schizophrenia than in healthy controls and in patients with other psychiatric disorders **(Bombin et al 2005).**

As a whole soft neurological signs have been found to be more strongly related to the presence of schizophrenia than hard neurological signs **(Bombin et al 2005).**

The prevalence rates of neurological signs in patients with schizophrenia ranges from 50 – 65% and 5% in healthy controls **(Bombin et al 2005).** The prevalence of neurological soft signs in first episode psychosis patients ranges from 20 – 97% and 5 – 50% in healthy controls **(Dazzan & Murray 2002).**

The variability in reported prevalence rates are attributed to differences in the definition of neurological impairment **(Bombin et al, 2005)** and differences in the scales used for assessment **(Dazzan & Murray 2002).**

This study attempts to study the prevalence of neurological soft signs in first episode psychosis patients by using the original version of Neurological Evaluation scale **(NES; Buchanan & Heinrichs 1989).**

REVIEW OF LITERATURE

"Are we to believe that the hemisphere is built on a plan fundamentally different from that of the motor tract? What can be an 'idea,' say of a ball, be, except a process representing certain impressions of surface and particular muscular adjustments? What is recollection, but a revivification of such processes which, in the past, have become part of the organism itself? What is delirium, except the disorderly revival of sensory-motor processes perceived in the past ; What is a mistake in a word, but a wrong movement, a chorea?.... Surely the conclusion is irresistible, that "mental" symptoms from disease of the hemisphere are fundamentally like hemiplegia, chorea, and convulsion".

- John Hughlings Jackson – 19th century

"It is not our business, it is not in our power, to explain psychologically the origin and nature of any of the depraved instincts manifested in typical cases of insanity …… it is sufficient to establish their existence as facts of observation, and to set forth the pathological conditions under which they are produced ; they are facts of pathology, which should be observed and classified like other phenomena of disease…… The explanation, when it comes, will come not from the

mental, but from the physical side – from the study of the neurosis, not from the analysis of the psychosis)

- Henry Maudsley – 19th century

They are the views of the pioneers (Schiffer & fogel , 1996) of two different faculties of a single organ – "BRAIN" which undoubtedly shows the inextricable underpinnings of Neurology and Psychiatry.

HISTORICAL BRIEF OF MENTAL DISORDERS IN RELATION TO NEUROLOGY

Since medicine began there has been the belief that there are two main categories of mental disorder, those due to natural or medical causes and those due to supernatural or moral causes. Throughout history either one or other gained the greater recognition and attention. Medicine had little responsibility for the mentally ill throughout many centuries, and apart from the belief among medieval physicians in the Greek notions of the humoral pathology of mental disorder, the prepotence of moral or supernatural causes was accepted by most educated persons. The great advances in physical and biological science during the 19th century led to the intensive study of the mentally ill from the point of view of the natural sciences. However, this phase was limited by the absence of any knowledge or techniques for other types of

enquiry. By the turn of the 20th century it was overtaken by the immense influence of psychoanalysis which directed attention once again, to the moral and psychological causes of mental disorder. It was only in the second half of the 20th century that psychiatry has begun to break from the constrains of philosophy.

The essential nature of the relationships between metal events and physical events in the nervous system remains as much as ever an unresolved mystery, but the amount of knowledge relevant to our understanding has increased vastly in last few decades. This applies not only to the cerebral mechanisms upon which such fundamental functions as consciousness, memory, emotion, attention and learning are dependent but also to the ways in which pathological processes can alter them. The application of techniques of investigation based upon discoveries in the neuroscience and psychology has made this possible. This too has been parelled by greater precision in the recognition and description of the clinical phenomena of organic cerebral disease. The tools of clinical diagnosis and investigation have been refined and extended. (Denis Hill 1977).

NEUROLOGICAL SIGNS IN RELATION TO PSYCHIATRY

The most frequently assessed neurological signs that have been grouped by Bombin et al is shown in table 1.

TABLE 1
Soft and Hard Neurological Signs Most Frequently Assessed Grouped by Their Denomination and Putative Neuroanatomical Localization

Cluster of Neruological Sign Denomination	Putative Localization	Individual Signs Assessed
Integrative Sensory function	Parietal Lobe	• Bilateral extinction • Audiovisual integration • Graphestiesia • Stereoagnosis • Right-left confusion • Extinction
Motor Coordination	Frontal lobe Cerebellar	• Intention tremor • Balance • Gait • Hopping • Finger – thumb opposition • Dysdiachokinesis • Finger-to-nose test
Sequencing of Complex motor acts	Prefrontal lobe	• Fist-edge-palm test • Fist-ring test • Ozeretski test • Go/no-go test • Rhythm tapping (Foot or hand)
Primitive reflexes	Frontal	• Glabellar tap • Jaw Jerk • Palmomental • Corneomandibular • Pout/snout • Sucking/oral • Grasp • Forced grouping
;Hard neurological signs	Central nervous system including cranial nerves	• Mirror movements • Synkinesis • Convergence • Gaze imperistence • Extrapyramidal signs • Pyramidal signs • Dyskinesia • Language • Speech

As mentioned earlier neurological signs includes ‘hard’ and ‘soft’ signs. The definition and usage of these terms had undergone considerable modification for the past three decades.

Differences in Definition

The term ‘soft signs’ was introduced by **Bender in 1947** to describe findings, suggesting possible neurological disease in his study upon childhood schizophrenia **(Sanders & Keshvan, 1998).**

Later in 1976 **Quitkin etal** refers the term ‘Soft signs’ to any neurologic deviation, motor, sensory, or integrative, that does not localize the site of a putative CNS lesion.

In 1984 **David Shaffer** adds that the designation ‘soft’ is usually taken to indicate that the person with signs shows no other feature of a fixed or transient neurological lesion or disorder.

In 1986 woods et al differentiates the ‘hard’ and soft signs by the presence & absence of primary tract or nucleus pathology **(Griffiths 1998).**

In 1988 in their review, **Heinrichs & Buchanan** ascribes specific functional domains and argues against the notion that the soft signs are

nonspecific, and have used the term ‘Neurological Signs’ throughout their review and named their scale also as a structured instrument for the assessment of “Neurological signs” in Schizophrenia which has ‘signs’ that are designated as ‘soft’ elsewhere in the literature.

In 1998 **Sanders & Keshavan** suggests the term ‘Neurologic exam abnormalities (NEA)’ instead of ‘hard’ or ‘soft’ due to their misleading meaning.

In 1998 **Griffiths et al** divides neurological signs into primary and integrative signs with a tendency to reflect focal and diffuse abnormality instead of ‘hard’ or soft signs and have denied usage of the term ‘soft’ signs in their study.

Despite these evolving controversies over its definition and usage, the term ‘Neurological soft signs’ is still retained and used in many recent literature and articles **eg. Goswami et al 2006, Barkus et al 2006.** In addition it has been reiterated that soft neurological signs have been found to be more strongly related to the presence of schizophrenia than hard neurological signs **(Bombin et al 2005).**

Differences in Categorization

As commented by Sanders & Keshavan the boundaries of these signs are also ‘soft’ in which the initial studies have included many features such as sinistriality, EEG dysrhythmias, and learning disabilities along with other neurological exam abnormalities.

The number of signs so far assessed in different studies ranges from 4-108 (**Bombin et al 2006)** wich may in part reflects the differences in categorization

Quitkin et al (1976), in their study on NSS in schizophrenia and character disorder have tested 25 items which includes speech, hearing, Babinski reflex.

Shaffer et al (1984), in their study on NSS in relation to psychiatric disorder and intelligence in childhood have tested 18 items.

By reviewing 25 years of studies on NSS, **Buchanan & Heinrichs** (1988, 1989) have presented the NES scale which has 26 items. In that scale neurological signs have been categorized into four domains – motor coordination, sensory integration, sequencing of complex motor acts and as ‘Others’

Shroder et al (1992) have presented a 17 items scale with five factors. these factors are motor coordination, integrative functions, complex motor tasks, right/left spatial orientation and hard signs. This hard sign factor includes arm holding test and mirror movements.

Sander et al (1994), by modifying NES have included palmomental reflex as 27^{th} items.

Griffith et al (1998) have included standard neurological examination in addition to NES items which includes cranial nerve palsies, tone and tendon reflexes.

Flyct et al (1999), By refuting NES and a scale by shroder et al they have assessed Neurological signs by a conventional neurological examination which includes facial expression, hypokinesia and tendon reflexes.

Sanders et al (2004, 2005) have reduced the 26 item NES scale into 13 item scale by factor analysis and have suggested as a solution to derive reliable and valid method for obtaining data in neurological assessment.

Bachmann et al (2005) have used Heidelberg scale for assessment of NSS which has 16 items and five subscales. The subscales are motor coordination, sensory integration, complex motor tasks, right / left spatial orientation, hard signs. The hard signs subscale includes arm holding test and mirror movements.

However many recent studies – Browne et al (2000), carr et al (2000), Yazici et al (2002), Aydemir et al (2005), Barkus et al (2006) - have used the original version of NES for assessment of NSS.

Differences in Assessment

Generally the results of assessment of hard signs are described dichotomously as normal or abnormal. Whereas assessment of soft signs are described in terms of degree of performance decrement rather than by presence or absence of abnormality **(Sanders & Kashavan 1998).**

In their review during 1988, **Hainrichs & Buchanan** have stated that there was tremendous variability among existing studies in how signs are elicited and rated and for many reports the exact methods were not described.

Another review by **Dazzan & murray** during 2002 states that a variety of instruments have been used to evaluate neurological dysfunction, and not all studies have used a published, validated instrument, which makes comparison of the results difficult.

It has been reiterated in 2005 review by **Bombin et al** that most of the neurological sign scales do not offer a cut off score and the marked variability in reported prevalence rates is due, in large part, to differences in the definition of neurological impairment.

Further the availability of multiple structured instruments to assess neurological impairment-The woods scale, the condensed neurological examination (CNE), the modified quantified neurological scale, the Heidelberger scale, the Cambridge Neurological inventory, and the neurological evaluation scale –**(Bombin et al 2005)** may in part reflect the differences in measurement of these signs.

SIGNIFICANCE AND MEANING OF NEUROLOGICAL SIGNS

In a review, **Heinrichs & Buchanan** – {1988} cautioned that with very few exceptions these revived studies were not designed to elaborate the meaning of neurological signs and the progress to date on this question was derived almost exclusively from post hoc analyses.

The meaning of soft signs ranges from an ironical comment that "The use of the term 'soft signs' and minimal brain damage is diagnostic of soft thinking "by Ingram TTS **(sanders & keshavan 1998)** to the suggestion that the presence of neurological soft signs may be indicative of being a "gene carrier" for psychosis by **E.Barkus** et al 2006.

Neurological signs are extensively studied in schizophrenia and moderately in other psychiatric disorders **(Bombin et al 2005).** Since this topic is dealt extensively in the recent review by Bombin et al 2005, the findings are presented here briefly.

Prevalence

The reported prevalence rates ranges from 50-65% in schizophrenic patients, 5% in normal control and the rates for other psychiatric disorder fall in between these 2 groups. The variability had been attributed to differences in the definition of neurological impairment and differences in the coverage of signs in the used scales.

Specificity

On examining whether NSS are specific to schizophrenia and any subgroup of signs are specific to schizophrenia, it has been concluded

that the soft signs are relatively specific to schizophrenia and subgroup specificity couldn't be confirmed with available results.

Neurological signs and Socio demographic Variables

The gender and age has no association with NSS and studies on other sociodemographic variables yielded mixed results.

Neurological signs and Psychopathology

The positive symptoms are not related to NSS, negative symptoms are related to NSS that reflect frontal and parietal functions. Disorganization symptoms are related to more broad neurological impairment.

Neurological signs and Cognitive functioning

Even though there is a positive association between NSS and cognitive functioning, they are partially independent phenomena in schizophrenia.

Neurological signs and Neuroimaging

No reasonable meaning could be ascertained with available studies due to the small number of studies and their correlations to nonspecific structural abnormalities.

Neurological signs and Antipsychotic Medication variables

There is no association between antipsychotic treatment and NSS and the association between extra pyramidal symptoms / Tardive dyskinesia remains unclear.

Stability over time / course of illness.

The vast majority of studies have failed to find correlations between neurological impairment and illness duration.

In the view that NSS is a trait feature of schizophrenia, they have concluded that from the initial expression during childhood in psychosis prone individuals the neurological abnormalities may remain silent for years. They may reappear during adolescence in the form of neurological signs possibly predating appearance of psychotic symptoms and possibly coinciding with the occurrence of negative symptoms and cognitive impairment. Form the onset of illness, NSS

would remain moderately stable, though they may suffer oscillations depending on state variables.

NSS as clinical and Functional outcome predictors

Majority of the studies support the hypothesis of an association between NSS and poorer functional outcome. However, they have noted that the neurological signs do not predict short term clinical outcome and have suggested for long term prospective longitudinal studies to get reliable data on this issue.

Neurological signs as Endophenotypes

Family studies and twin studies show presence of neurological signs in unaffected relatives and discordant monozygotic twins in an intermediate range between healthy controls and schizophrenic patients. With these findings and a replicated finding of lack of association between obstetric complications and NSS in patients, the authors asserts a genetic origin of neurological soft signs. Further they suggests that neurological soft signs may represent a valid phenotype to be adopted as a biological marker for genetic research.

The above mentioned view by **Bombin et al** has been furthered by a recent study by **Barkus et al (2006).** In this study they have assessed the NSS by NES between a group of normal volunteers with positive schizotypy and a control group. They have found significantly higher total NES score in psychosis prone group (schizotypy). They have suggested that the presence of NSS may be indicative of being a 'gene carrier' for psychosis.

STUDIES REPORTING PREVALENCE OF NSS IN FIRST EPISODE PSYCHOSIS

Sanders et al 1994 have found higher NES mean scores in all subscales in first episode neuroleptic-naïve patients (N-17) than in control subjects (N-15). Prevalence of NSS was not mentioned in this study.

Gupta et al, 1995 : This study group had 26 Neuroleptic- naive patients 126 neuroleptic treated patients, and 117 control subjects . On assessing the NSS by comprehensive neurological examination, the subjects have been ascertained of having NSS if they had at least one NSS or developmental reflex. They have found 42% prevalence for total patient group, 23% for neuroleptic- naive group ,and 46% for

neuroleptic-treated group.NSS was not found in normal comparison group

Flyct et al 1999 : In this study the neurological assessment was done by a conventional neurological protocol. The patient group had 21 first episode patients and 18 chronic schizophrenic patients. That controle group had 55 subjects . Out these 39 patients, 78% (29/37) were neurologically aberrant (presence of one sign) and 7% (4/55) of control group were neurologically aberrant.

Carr et al 2000 have compared NSS between first episode patients and ‘at risk’ group and had not found any difference in NES scores. There was no control group in this study. Prevalence of NSS wasn’t mentioned in this study.

Browne et al 2000 used to scales for assessment of NSS, Neurological Evaluation scale (NES) and Condensed Neurological examination. It has been reported that 97% of patients with first episode psychosis displayed at least one NSS (defined as one NES item rated 2) and 63% of patients had a minimum of two NSS (2 or more NES items rated 2). There was no control group in this study.

Keshavan et al 2003 compared 90 neuroleptic naive patients with schizophrenia, 39 non schizophrenic patients and 93 healthy subjects. They evaluated the NSS by their factor structure model of NES and found higher neurological abnormalities in schizophrenic group than in nonschizophrenics and healthy controls. Prevalence of NSS was not mentioned in this study.

Sanders et al 2004 compared neuroleptic- naive schizophrenia (N-59), other psychosis (N-27) and healthy controls (N-51) by their factor structure model of NES. They have found frequency of abnormal findings (NES Score 1 or 2) for individual items 3% to 63% in patients and 0% to 47% in healthy controls. The frequency of marked abnormal findings (score-2) varied from 0% to 40% in patients and 0% to 20% in healthy controls.

Cigdem et al 2005, compared 22 antipsychotic naïve schizophrenic patients, 22 antipsychotic treated patients and 22 healthy controls. They reported higher NSS total scores in both schizophrenic groups than healthy controls. Their was no significant difference between the two schizophrenic groups. Prevalence was not mentioned in this study.

Bachmann et al 2005 compared and followed up 39 first episode patients and 22 healthy controls. The have found elevated NSS scores at two measurement points (after remission of acute symptoms and 14 months later) in patients than control. Prevalence was not mentioned in this study. But NSS scores decreased during second assessment in patient group.

The Scottish schizophrenia research group 1987 , have reported 20 % prevalence in first episode schizophrenia **(Dazzan & Murray 2002).**

Shibre et al 2002 have reported 65% prevalence in patient groups (NES) score 2 and 50% in healthy subjects **(Bombin et al 2006).**

The prevalence of NSS in healthy subjects was reported to vary from 5% to more than 50% **(Dazzan & Murray, 2002).**

Nizamie et al 1989 : They have studied 107 adult schizophrenics , of which 60 were chronic patients and 47 were acute schizophrenic patients .they have evaluated a set of operationally defined neurological signs which has 17 items .They have found 17.32% prevalence for acute

schizophrenics, (3months duration) and 53.33% for chronic Schizophrenics. There was no control group in this study.

Lal et al 1998 studied 23 schizophrenics patients.They evaluated NSS according to 4 lobes of brain and found the presence of NSS (at least one NSS) in all their study patients

AIM OF THE STUDY

To study the prevalence of Neurological soft signs(NSS) in first episode psychosis patients in comparison with apparently healthy controls.

HYPOTHESIS

The prevalence of Neurological soft signs is higher in first episode psychosis patients than in healthy controls.

MATERIALS & METHODS

Setting

This study was conducted at the out patient department of psychiatry, Government Stanley Medical college. Cases were recruited from out patient department of psychiatry and controls were selected from medical wards. Study was conducted from July to September in the year 2006.

Sample

The **study group** was selected from Psychiatry outpatient clinic. The first episode psychosis was defined as patients attending first time to a psychiatry service with a psychotic episode without past history of any mental disorders. With the well established view that there is no association between antipsychotic treatment and NSS (Bombin et al 2005), the patients on antipsychotics were also included in the study. Thus, patients newly attending the out patients service during the study period and first episode patients on treatment were included in the study.

Thirty patients and controls were selected with the following criteria

PATIENT GROUP

Inclusion criteria

1. First episode psychotic patients without past history any mental disorders.
2. Age group 16 – 60 years
3. With minimum requirement of primary education.

Exclusion criteria

1. Psychotic patients with past history of any mental disorders.
2. Psychotic disorders secondary to general medical condition / Neurological disorders.
3. Psychotic disorders secondary to Alcohol / other substance use disorders.
4. Psychotic states secondary to other mental disorders ie. Mood disorders with Psychotic symptoms.
5. Psychotic disorders in the Presence of subnormal intelligence

6. Un cooperative Patients.
7. Patients with history of head trauma resulting in loss of consciousness for more than 1 hour or anterograde amnesia for more than 24 hours.
8. Illiterate Patients

CONTROL GROUP

The control group was selected from accompanying persons of patients in the medical wards with following criteria.

Inclusion criteria

1. Age group : 16-60yrs.
2. With minimum requirement of primary education

Exclusion Criteria

1. Individuals with past history of mental disorders
2. Individuals with family history of mental disorders
3. Individuals with history of alcohol / other substance abuse

4. Individuals with Neurological disorders / general Medical conditions affecting CNS.

5. Individuals with history of head trauma in the recent past resulting in LOC / Amnesia.

6. Illiterate individuals .

Assessment Instruments

1) Neurological evaluation scale with its requirements (cards for rhythm tapping and visual integration tests, objects for stereo gnosis).

2) ICD-10 diagnostic criteria for diagnosing psychiatric disorders.

3) Self structured Proforma

4) Self structured NSS scoring sheets I & II.

NEUROLOGICAL EVALUATION SCALE(NES)

The Neurological evaluation scale is a structured scale that presents scores in four subscales – sensory integration, motor coordination, sequencing of complex motor acts and 'others'. Apart the tests for cerebral dominance it has 26 discrete items, of which 14 are tested bilaterally. Each item is scored using anchored ratings of 0-normal, 1-mild, but definite impairment, 2-marked impairment except for the snout and suck reflexes which are scored as either 0 or 2. The motor coordination subscale includes tandem walk, rapid alternating movements, finger thumb opposition , and the finger-nose test . The Sensory integration subscale includes audio-visual integration, stereognosis, graphesthesia , extinction, right / left confusion. Sequencing of complex motor acts subscale includes the first-ring test , Fist-edge palm test , the ozeretski test and rhythm tapping test B. 'Others' subscale includes adventitious overflow the Romberg test, tremor , memory, mirror movements , rhythm tapping test A, synkinesis , convergence ,gaze impersistence , glabellar reflex, snout reflex, grasp reflex , and suck reflex. Higher scores indicate greater neurological impairment.

In this study the score of 2 was taken as positive for NSS.

NSS Scoring Sheet I

It contains individual items and its scorings as per NES. The scores of individuals are marked during assessment.

NSS Scoring Sheet II

In this, individual items were arranged according to the subscales of NES. The positive scores (score-2) of individuals alone are marked against the individual items after assessment.

PROCEDRUES

This study was started after obtaining ethical approval from ethical committee of Stanley medical college. The nature and purpose of the study was explained to all participants and informed written consent was obtained before assessment. New cases were diagnosed according to ICD 10 criteria. The diagnosis of on treatment cases were confirmed by reviewing records with a cross checking with patients and informants. The details of patients were entered in the self structured Performa.

NSS ASSESSMENT

NSS assessment was done by the original version of neurological evaluation scale **(NES:Buchanan & Heinrichs 1989)** made in the outpatient department. Cards were produced with rhythms for rhythm tapping (A&B) and audio-visual integration tests. For the stereognosis test participants were asked to identify pencap, coins, eraser, and a sellotape coil. Two items were identified in each hand. The administration of the NES tests took approximately 45 minutes to complete.

Data Collection

The scores of individual's items were marked in NSS scoring sheet –I during assessment. Then the positive scores (Score 2) of individuals alone were entered in NSS scoring sheet II. The positivity of individuals for NSS entered in master chart and data s analyzed

Statistical analysis

For continuous variability (age & yrs. of education) descriptive statistics (mean & standard deviation) was used. For ascertaining the significance of intergroup variability chi-square test was used. Analysis was made with SPSS software.

RESULTS & DISCUSSIONS

DEMOGRAPHIC AND CLINICAL DATA

The patient group had 19 males and 11 females. The patients had a mean age of 30.2 ± 11.5 years and a mean years of education 9± 3.3 years. Out of thirty patients 10 were drug- naïve patients, 20 were on antipsychotic medication. Most of the medicated patients were on Haloperidol and Trihexypheniodyl. The duration of medication ranged from one to three months.

Among the thirty patients 15 patients had the diagnosis of schizophrenia, 6 patients had the diagnosis of other non organic psychotic disorder, 5 patients had the diagnosis of acute and transient psychotic disorder 3 where with delusional disorder, and one had the diagnosis of unspecified non organic psychosis.

The control group also had 19 males and 11 females. Their mean age was found to be 31.2 ± 12.3 yrs. Their mean years of education was 8.6 ± 3.5 yrs. Except one control subject, who had left handedness, all other subjects in both groups were right handed individuals.

The mean age and years of education is shown in Table 2, and the same is depicted in Graph 1.

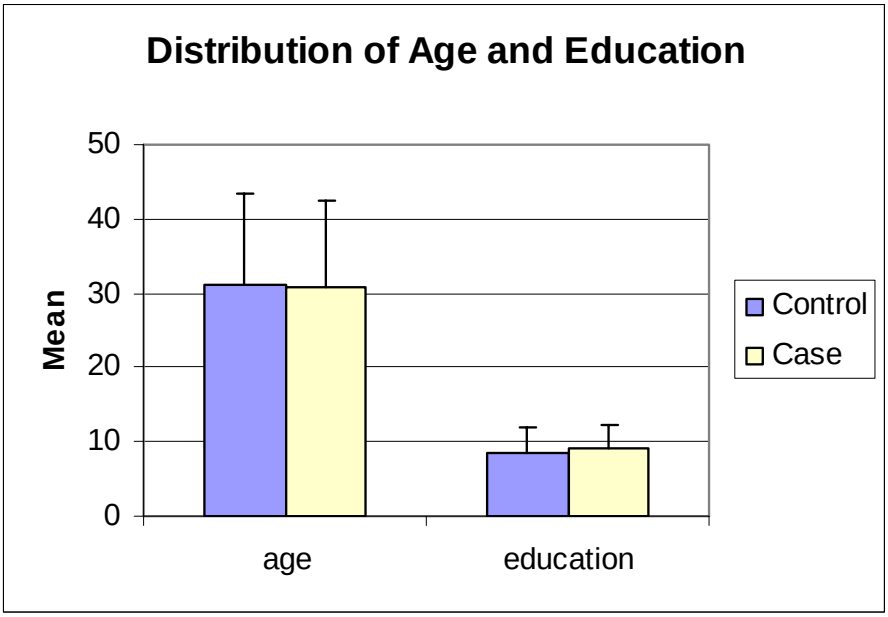
The number of males and Females in both group is shown in Table 3 and the sex distribution is depicted in Graph 2.

TABLE – 2 MEAN AGE & YEARS OF EDUCATION

	Control (n = 30)		Case (n = 30)		t	df	p value
	Mean	S D	Mean	S D			
Age in years	31.2	12.3	30.8	11.5	0.1	58	0.897
Years of education	8.6	3.5	9.0	3.3	0.4	58	0.677

There is no significant difference in age and years of education between groups.

GRAPH -1



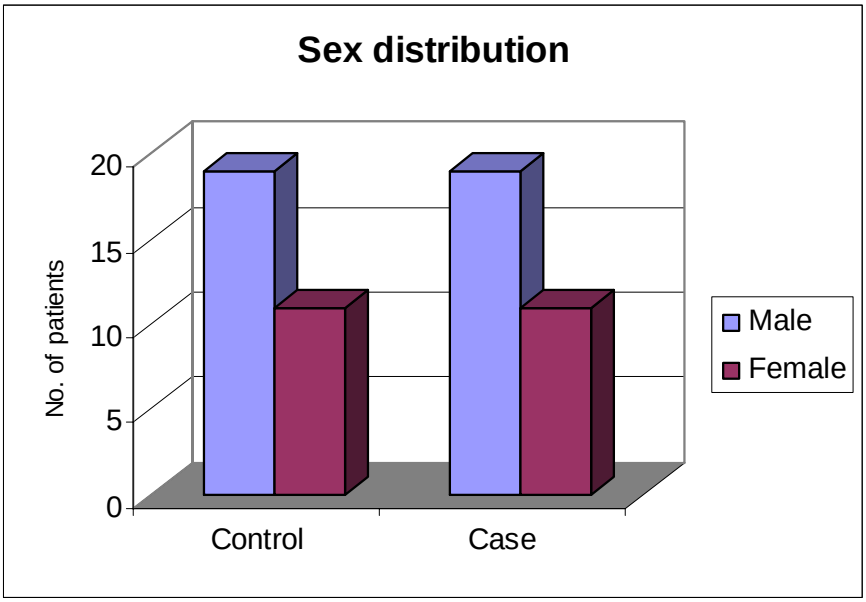
There is no difference in age and years of education.

TABLE 3 : NUMBER OF MALES & FEMALES

Sex	Control N	Case N	Total
Male	19	19	38
Female	11	11	22
Total	30	30	60

Both group had 19 males & 11 females

GRAPH 2: SEX DISTRIBUTION



There is no difference in sex distribution between study & control subjects.

NEUROLOGICAL SOFT SIGNS

The results individual item is shown in Table 4. This table shows the number and percentage of the subjects with positive score (score2) against individual items of NES.

Out of 41 items only 3 were found to be statistically significant, which includes Rt & lt synkinesis (P value - < 0.05), suck reflex (P value <0.01), These three items were more common in patient group.

Ten items were not scored in both groups. They include Rt & Lt stegeognosis, Tandem walk, Rt & Lt fingers nose test, Romberg, Re & Lt tremor, Rt & Lt group reflex.

These differences on individual items might be due to the small size of sample and the scoring method of positivity in this study (NES score 2).

Table 4;the number and percentage of the subjects with positive score (score 2) against individual items of NES.

ITEM	Control (n = 30)		Case (n = 30)	
	N	%	N	%
Sensory integration				
Av integration	7	23.3	11	36.7
Rt steregnosis	-	-	-	-
Lt stereognosis	-	-	-	-
Rt graphaesthesia	11	36.7	10	33.3
Lt graphaesthesia	8	26.7	6	20.0
Extinction	0	0.0	1	3.3
Rl confusion	2	6.7	6	20.0
Motor coordination				
Tandemwalk	-	-	-	-
Rt rapid alternating movements	0	0.0	1	3.3
Lt rapid alternating movements	0	0.0	2	6.7
Rt finger thumb opposition	1	3.3	2	6.7
Lt finger thumb opposition	1	3.3	2	6.7
Rt finger nose test	-	-	-	-
Lt finger nose test	-	-	-	-
Sequencing of complex motor acts				
Rt fist ring test	1	3.3	0	0.0
Lt fist ring test	0	0.0	2	6.7
Rt fist edge palm	2	6.7	1	3.3
Lt fist edge palm	0	0.0	3	10.0
Ozeretski	9	30.0	15	50.0

Rhythm tapping B	8	26.7	8	26.7
Others				
Rt adventitious overflow	1	3.3	0	0.0
Lt adventitious overflow	0	0.0	2	6.7
Romberg	-	-	-	-
Rt tremor	-	-	-	-
Lt tremor	-	-	-	-
Memory 5mts	5	16.7	6	20.0
Memory 10mts	-	-	-	-
Rhythm tapping test A	9	30.0	11	36.7
Rt mirror movements	3	10.0	1	3.3
Lt mirror movents	2	6.7	2	6.7
Rt synkinesis*	5	16.7	13	43.3
Lt synkinesis*	4	13.3	12	40.0
Rt convergence	0	0.0	2	6.7
Lt convergence	0	0.0	2	6.7
Rt gaze impersistence	2	6.7	3	10.0
Lt gaze impersistence	1	3.3	4	13.3
Glabellar reflex	1	3.3	4	13.3
Snout reflex	1	3.3	2	6.7
Rt grasp reflex	-	-	-	-
Lt grasp reflex	-	-	-	-
Suck reflex **	1	3.3	11	36.7
* $p < 0.05$, ** $p < 0.01$				

There is significant difference in 3 items - Rt & lt synkinesis, suck reflex. These three items were more common in patient group.

Table 5 ,Shows the Number of subjects in relation to number of positive signs.

Table 5 : number of subjects in relation to number of positive signs.

No. of Positive NSS	Control N	Case N	Total
0	11	1	12
1	2	0	2
2	2	6	8
3	5	6	11
4	4	3	7
5	1	2	3
6	1	5	6
7	0	3	3
8	2	1	3
9	1	0	1
10	0	1	1
11	0	1	1
12	1	0	1
14	0	1	1
Total	30	30	60

One subject from control group had shown 12 positive signs. This might be due to selection bias

Table 6 shows the total number of persons and percentage in each group in relation to number of positive signs.

Table 6 : Total number of persons and percentage in each group in relation to number of positive signs.

	Control		Case		
NSS	N	%	N	%	p value
1 & above*	19	63.3	29	96.7	< 0.05
2 & above*	17	56.7	29	96.7	< 0.05

When assessed for presence of one NSS 29 patients (96.7%) had NSS and 19 controls (63.3% had NSS)

When assessed for presence of two NSS the patient group displayed the same results and control group had slight reduction (n-17, 56.7%).

There was significant difference ($P<0.05$) at both levels of assessment in which patient group exhibited more prevalence of NSS (96.7%) than control group (56.7 to 63.3%).

This finding is near similar to that of a study by Browne et al (2000). In that study they have found presence of at least one NSS (defined as one NES item rated 2) in 97.1% (N=34) patients and presence of two NSS (2 or more NES items rated 2) in 63% patients. There was no control group in this study.

With the limitations of selection bias the findings in control group is also in par with the reported findings by Dazzan & Murray (2002), and Bombin et al (2005).

Dazzan & Murray have reported that the prevalence of NSS in healthy controls ranged from 5% to more than 50%.

Bombin et al have reported 50% prevalence in healthy controls from a study by Shibre et al.

These findings in both groups are higher than the findings in Gupta et al, flyct et al, and Sanders et al (2004).

Notably the studies showing near similar results like this study- Browne et al, shibre et al – have used the original version of NES and have adopted the same scoring system in reporting , as of in this study. Those studies reporting dissimilar results Gupta et al, Flyct et al, sanders et al have used different scales and have adopted different scoring method in contrast to this study.

Table 7 shows the comparison of Total NES scores and subscale scores between groups.

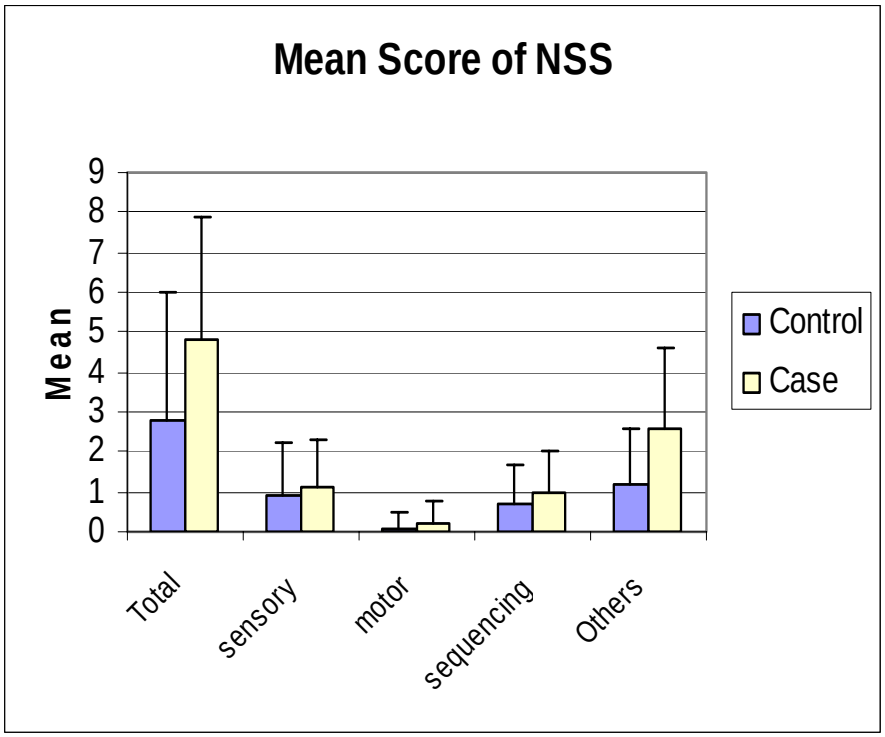
Table 7 : Comparison of Total NES scores and subscale scores between groups.

NES Scores	Control (n = 30)		Case (n = 30)		t	df	p value
	Mean	S D	Mean	S D			
Total NEE Scores	2.8	3.2	4.8	3.1	2.5	58	0.016
Sensory Integration	0.9	1.3	1.1	1.2	0.6	58	0.535
Motor coordination	0.1	0.4	0.2	0.6	1.3	58	0.213
Sequencing of complex motor acts	0.7	1.0	1.0	1.0	1.1	58	0.257
Others	1.2	1.4	2.6	2.0	3.1	58	0.003

The two groups differed significantly in Total NES scores ($P<0.016$) and on other's subscale ($P<0.003$), with higher scores in Patient group.

The mean scores of NES is depicted in the graph 3.

Graph 3.



The Total NES scores and ‘others’ subscale score is higher in cases than in controls.

The total NES scores were similar to the results of Cigdem et al (2005) Lawrie et al, 2001 and Egan et al (2001). But they were lower than the results of Browne et al, carr et al, and Dazzan et al (2004).

The ‘Others’ subscale, score is similar to the results of Cigdem et al, and Lawrie et al.

There was no significant difference in subscale like ‘sensory integration , motor coordination , and sequencing of complex motor acts between groups.

Bombin et al 2005 have mentioned that the subscale functional domains lacks specificity due to the mixed results from different studies.

However , Arango et al 1999 in their study on Neurolopsyhological performance by Neurological signs have reported that the ‘Others’ soft signs subscale was able to correctly classify a greater number of patients and controls to their true group than the other subscales from the NES.

Barkus et al 2006 have found significant difference in Total NES scores and ‘Others’ soft signs subscale between high proneness (schizotypy) group and control group. They have not found significant difference in sensory integration, motor coordination, sequencing of complex motor acts subscales. Upon their results they have suggested that the other soft signs subscale may be particularly sensitive in identifying those with schizophrenia or a proneness to it.

This study also falls in the line with the above mentioned studies in subscale scores.

SUMMARY AND CONCLUSION

This study is an attempt to study the prevalence of NSS in first episode psychosis patients in comparison with apparently healthy controls. This study assessed the NSS by the original version of Neurological Evaluation scale.

Thirty patients and thirty age and sex matched controls were selected by inclusion and exclusion criteria. There were 19 males and 11 females in each group. The mean age of cases was 30.8 years and for controls 31.2 yrs. The mean years of education for cases was 9 yrs and for controls 8.6 years.

The **prevalence of NSS** in **patient group** was found to be **96.7%** at two levels of assessment. The prevalence of NSS in **control group** ranged from **56.7% to 63.3%** between two levels of assessment. There was significant difference in the prevalence of NSS at both levels of assessment with more prevalence in patient group.

The total NES scores and score on others subscale of NES was significantly higher in patient group than in control group.

Thus, this study is in conformation with other studies in reporting presence of significantly higher NSS in first episode psychosis patients than in controls.

The variability in the prevalence may be attributed to the difference in the scales and scoring method as pointed by Bombin et al.

However the prevalence found in this study is in near conformation with two other studies- Browne et al and Shrib et al which have assessed the NSS and have adopted the scoring method in reporting as of in this study.

The soft signs are defined as ‘non localizable’ neurological signs that are thought to reflect damage in connections between subcortical and cortical areas or between cortical areas **(Barkus et al, 2006),** or otherwise reflect diffuse brain dysfunction **(yazici etal 2002).**

It has been stated by **Marsel Mesulam** that there are no centers for ‘hearing words’, ‘perceiving space’ or “storing memories”. Cognitive and behavioural functions (domains) are coordinated by intersecting large scale neural networks that contain interconnected cortical and subcortical components.

These networks are classified into five large scale networks; a perisylvian network for language ; a parieto-forntal network for spatial recognition ; an occipito- temporal network for face and object recognition ; a limbic network for retentive memory ; and a prefrontal network for attention and comportment (Text book : Harrisons's principles of Internal medicine).

In addition **Sanders & Keshavan (1998)** have quoted that although anatomic specificity is uniquely valued in neurology, it may not be as important in Psychiatry, in which localization is less central to diagnosis.

With the above mentioned literature by **Marsel Mesulam** and **Sanders & Keshavan** it appears that, classifying neurological signs in psychiatry based on localization may become less and less significant in future.

Under the purview of above mentioned literature reviews it seems, the 'Soft' signs are becoming 'hard' in their significance and meaning.

As mentioned earlier, the variability in reportings on NSS may be , in part, due to lack of consensus on its definition , classification and assessment procedures. Thus, it appears, reaching a consensus may ‘soft’en the researchers towards the ‘hard’ening ‘soft’ signs.

LIMITATIONS

1. The size of the sample is small which limits the generalization of results.
2. No screening instrument was used for control subjects which might have resulted in selection bias.

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CONSENT FORM

I was informed and explained of the purpose and nature of the study. I am willing to participate in this study . I here by give my full consent for the study.

Signature of patient/control.

Name of patient/control:

Neurological Evaluation Scale

Cerebral Dominance

a. Handedness

Instructions : Ask subject to demonstrate how he/she would write throw a ball use a tennis racket, strike a match, use scissors, thread a needle, use a broom, use a shovel, deal cards, use a hammer, brush teeth, and unscrew the lid of a jar.

Assessment : R = Subject writes with right hand and performa at least seven other activities with right hand ; M-subject; writes with right/left hand but performs less than seven other activities with right / left hand ; L-Subject writes with left hand and performs at least seven other activities with left hand.

b. Footedness

Instructions : Ask subject to demonstrate how he/she would kick a ball.

Assessment : R = Subject kicks ball with right foot ; L-Subject kicks ball with left foot.

c. Eyedness

Instructions : Ask subject , with both eyes open, to look at a distant object through a hole in the center of a 3-inch * 5-inch index card that is held with both hands 18 inches in front of the subject. The subject is to close one eye at a time and tell the examiner with which eye closed did he / she lose sight of the object.

Assessment : R = Subject loses sight of object with right eye closed ; L-Subject loses sight of object with left eye object.

1. Tandem Walk

Instructions : Subject to walk, in a straight line, 12 feet, heel to toe.

Assessment : 0 = no missteps after subject has completed first full step ; 1 = one or two missteps after completion of first full step ; 2=3 or more missteps, grabbing or falling.

2. Romberg Test

Instructions : Subject to stand with his /her feet together, eyes closed, his/her arms held parallel to the floor, and fingers spread a part. The subject is to maintain this position for 1 min.

Assessment : 0 = relatively stable, minimal swaying ; 1 = marked swaying ; 2=subject step to maintain balance or falls.

3. Adventitious Overflow

Instructions : Same as Romberg Test.

Assessment : 0 = absence of movement of fingers, hands, or arms; 1=irregular fluttering movement of fingers only ; 2=irregular fluttering movement extended to hands and / or arms.

4. Tremor

Instructions : Same as Romberg Test.

Assessment : 0 = no tremor ; 1 = mild, fine tremor ; 2 = marked, fine or coarse tremor.

5. Audio – Visual Integration

Instructions : The subject is asked to match a set of tapping sounds with one of three sets of dots presented on a 5-inch * 7-inch index card. The subject is instructed to close his/her eyes during the tapping. Three practice trails are performed first to ensure that the subject understands the directions.

Assessment : 0 = no error ; 1 = one error , 2 = two or more errors.

6. Stereognosis

Instructions : Subject, with eyes closed, is asked to identify an object placed in his / her hand. Subject is instructed to feel the object with one hand and to take as much time as needed. If subject cannot name the object, he/she is asked to describe for what purpose the object is used. The subject starts with the dominant hand, based on the prior evaluation of handedness, or the hand with which he / she writes, if there is mixed hand dominance. The instructions are repeated at the beginning of the second trail.

Assessment : 0 = no error ; 1 = one error , 2 = more than one errors.

7. Graphesthesia

Instructions : Subject, with eyes closed, is asked to identify the number written on the tip of his/her forefinger. The order of hands is determined as with stereognosis.

Assessment : 0 = no error ; 1 = one error , 2 = more than one errors.

8. Fist – Ring Test

Instructions : The subject is asked to alternative placing his / her hand on the table, in the position of a fist, with the thumb placed either over the knuckles or over the middle phalanges and placing his / her hand, on the table, in the position of a ring, with the tips of the thumb and forefinger touching and the remaining three fingers extended. The subject is to bring his / her arm into the upright position between each change in hand position. If the subject does not perform the movement accurately or in a manner that can be appropriately assessed, he/she is to be stopped, to be reinstructed, and to start the test again. The subject is to repeat each set of hand positin changes 15 times.

Assessment : 0 = no major disruption of motion after first repetition;; errors limited to incomplete extension of fingers in ring position and no more than two hesitancies in the transition from fist to ring or vice versa and no more than one fist/ring confusion; I =no major disruption of motion after first repetition or complete breakdown of motion;; more than two hesitancies in the transition from

fist to ring difficulty in developing and marinating a smooth, steady flow of movement, three to four fist/ring confusions, or any total of three but not more than four errors. 2-major disruption of movement or complete breakdown of motion, or more than four fist/ring hesitations or confusions.

9. Fist-Edge-Palm Test

Instructions : Ask the subject, using a smooth and steady rhythmic pattern, to touch the table with the side of his/her fist, the edge of his/her hand, and the palm of his /her hand. The subject is to break contact with the surface of the table between each change in hand position, but not to bring the arm back in full flexion. The subject is to repeat this sequence of position changes 15 times.

Assessment : 0 = no major disruption of motion after first repetition; errors limited to no more than two hesistancies in the transition from one position to the next and no more than one mistake in hand position. 1 = no major disruption of motion after first repetition or complete breakdown of motion; more than two hesitancies in the transition from one position to another, difficulty in developing and maintaining a smooth, steady flow of movement, three to four position confusions, or any total of three or four errors. 2-major disruption of movement of complete breakdown of motion, or more than four hesitations or position confusions.

10. Ozeretski Test

Instructions : The subject is to place both hands on the table, one hand palm down and the other hand in the shape of a fist. The subject is then asked simultaneously to alternate the position of his /her hands in a smooth and steady motion. The subject is asked to repeat this motion 15 times.

Assessment : 0 = no major disruption of motion after first repetition ; errors limited to no more than two hesitancies in the transition from one position to the next and no more that one mistake in hand position. 1 = no major disruption of motion after first repetition or complete breakdown of motion; more than two hesistancies in the transition from one position to another, difficulty in developing and maintaining a smooth, steady flow of movement, three to four position confusion;, or any total of three, but no more than four errors. 2=major disruption of movement or complete breakdown of motion, or more than four hesitations or position confusions.

11. Memory

Instructions : Subject, is told four words and is asked to repeat them immediately after they are all presented. If the subject is unable to repeat the four words correctly, they are represented. If the subject still cannot repeat the four

words after a total of three of three presentations of the words. The test is terminated and the subject is given a score of 2 for both parts of the item. If the subject is able to repeat the four words after the initial or two subsequent presentations, he / she is then asked to remember the words as well as possible and told that he / she will be asked to repeat; the words twice later on during the interview. The subject is then asked to recall the four words at 5 and 10 min.

Assessment : 0 = Subject remembers all words; 1 = Subject remembers three words; 2= Subject remembers fewer than three words.

12. Rhythm Tapping Test A

Instructions : Ask the subject to reproduce exactly the series of taps heard while the subject has eyes closed. The subject may have eyes open while reproducing series of taps.

Assessment : 0 = no error ; 1 = one error of either nondiscrimination between soft and hard sounds, rhythm, or error in number of taps; 2= more than one error.

13. Rhythm Tapping Test B

Instructions : Ask the subject to produce a series of taps as instructed.

Assessment : 0 = no error ; 1 = one error ; 2 = more than one error.

14. Rapid Alternating Movements

Instructions : Ask the subject to place his /her hands palm down on legs. The subject is to start with his/her dominant hand and is to slap his/her leg distinctly with the palm and the back of his/her hand in an alternating motion. The determination of dominance is as described above (see item 8). The subject is to perform the task 20 times, with both hands, on hand at a time.

Assessment : 0 = no major disruption of motion, hesitation, or mistake in hand placement : 1 = no major disruption of motion or one to two hesitations or mistakes in;; hand placement 2= major disruption of motion or three or more hesitations or mistakes in hand placement.

15. Finger- Thumb Opposition

Instructions : Ask the subject to place both hands plam up with fingers fully extended on his/her legs. The subject is to start with his/her dominant hand and is to touch the; tip of his/her fingers with the tip of his/her thumb, from forefinger to pinky, returning to forefinger, for a total of 10 repetitions.

Assessment : 0 = no major disruption of motion and no more than one mistake; 1=no major disruption of motion or two to three mistakes; 2= major disruption of motion or four or more mistakes.

16. Mirror Movements

Instructions : The subject's hand which is not performing the finger-Thumb opposition Test, is observed for parallel movements of the fingers and thumb.

Assessment : 0 = no observable movements of the fingers; 1=minor, inconsistent, or repetitive movements of the fingers; 2= consistent, distinctive movements of the fingers.

17. Extinction (Face-Hand Test)

Instructions : The Subject is seated, with hands resting palm down, on his /her knees and with eyes closed. The subject ;is told that he /she will be touched on either the check, hand, or both and is to say where he/she has been touched. If the subject names just one touch, he/she is asked – first time this occurs only – if he /she felt a touch anywhere else. The simultaneous touching is done in the following order ; right check-left hand, left check-right hand, right check-right hand, left check-left hand, both hands, and both cheeks.

Assessment : 0 = no error ; 1 = one error , 2 = more than one error.

18. Right / Left Confusion

Instructions : Subject is asked to point to his /her right foot, left hand ; place his /her right ;hand to left shioulder, left hand to ruight ear point to examiners left knee right elbow, with examiner's arms crossed, point to

examiner's left hand with his/her right hand, and with examiner recrossing arms, point to examiner's right hand with his/her left hand.

Assessment : 0 = no error ; 1 = one error , 2 = more than one errors.

19. Synkinesis

Instructions : Subject is instructed to follow the cap of a pen with his/her eyes only as it is moved between extremes of horizontal gaze. If the subject moves his/her head, the subject is asked to keep his/her head still and follow the cap of a pen with the eyes only.;

Assessment : 0 = no movement of the head ;; 1=movement of the head on first trial but not when specifically told to keep head still 2 = movement of the head even when told to keep head still.

20. Convergence

Instructions : Subject is instructed to follow the cap of a pen with his/her eyes as it is moved toward the subject's nose.

Assessment : 0 = both eyes converge on object ; 1=one or both eyes are unable to converge completely but can converge more than halfway; 2=one or both eyes fail to converge more than halfway.

21. Gaze impersistance

Instructions : Subject is instructed to fix his /her gaze on the cap of a pen at a 45^0 angle in the horizontal plane of the right and left visual fields for 30^0 sec.

Assessment : 0 = no deviation from fixation; 1=deviation from fixation after 20 sec; 2 = deviation from fixation before 20 sec.

22. Finger to Nose Test

Instructions : The subject is instructed to close eyes and touch the tip of his/her nose with the tip of his /her index finger.

Assessment : 0 = no intention tremor or passpointing ; 1 = mild intention tremor or pass pointing ; 2 = marked intention tremor or passpointing.

23. Glabellar Reflex

Instructions : Subject is instructed to fix his /her gaze on the point across the room. The subject is approached from above the forehead outside of the visual field, and the examiner taps the glabellar region 10 times with the index finger.

Assessment : 0 = three or fewer blinks ; 1=four or five full blinks ; 1=four or five full blinks, or more than six partial or full blinks; 2-six or more full blinks.

24. Snout Reflex

Instructions : Subject is instructed to relax, and the examiner presses his finger against the subject’s philtrum.

Assessment : 0 = no contraction of the orbicularis orris (or puckering of the lips); 2=any contraction of the orbicularis orris (or puckering of the lips).

25. Grasp Reflex

Instructions : The subject is instructed not to grab, and the examiner strokes the inside of the subject's palm between the index finger and thumb. This procedure is repeated a second time with the subject being asked to spell the world "help" backwards

Assessment : 0 = no flexion of the subject's fingers; 1=mild flexion of the subject's fingers on first trail or flexion of any kind on second trial; 2=marked flexion of the subject's fingers on first trial.

26. Suck Reflex

Instructions : The examiner places the knuckle of a flexed index finger or tongue depressor between the subject's lips.

Assessment : 0 = no movement ; 2= any pursing or sucking motion by the subject's lips.

		NEUROLOGICAL SIGNS SCORING SHEET I					
		Patient/Control Name :					
	Handedness				R	L	M
	Footedness				R	L	M
	Eyedness				R	L	M
	Cerebral dominence :				R	L	
1	Memory						
	5 min				0	1	2
	10 min				0	1	2
2	Stereognosis						
	Right				0	1	2
	Left				0	1	2
3	Graphasthesia						
	Right				0	1	2
	Left				0	1	2
4	Extinction				0	1	2
5	Right &Left confusion				0	1	2
6	Synkinesis						
	Right				0	1	2
	Left				0	1	2
7	Convergence						
	Right				0	1	2
	Left				0	1	2
8	Gaze Impersistence						
	Right				0	1	2
	Left				0	1	2
9	Glabellar tap reflex				0	1	2
10	Grasp reflx						
	Right				0	1	2
	Left				0	1	2
11	Snout Reflex				0		2
12	Suck reflex				0		2
13	Rapid alternating Movements						
	Right				0	1	2
	Left				0	1	2
14	Finger-Thumb Opposition						
	Right				0	1	2
	Left				0	1	2

15	Mirror Movements						
	Right				0	1	2
	Left				0	1	2
16	Finger - Nose Test						
	Right				0	1	2
	Left				0	1	2
17	Tandem walk				0	1	2
18	Romberg's				0	1	2
19	Adventitious Overflow						
	Right				0	1	2
	Left				0	1	2
20	Tremor						
	Right				0	1	2
	Left				0	1	2
21	Fist - ring test						
	Right				0	1	2
	Left				0	1	2
22	Fist - Edge - Palm test						
	Right				0	1	2
	Left				0	1	2
23	Ozeretski test				0	1	2
24	Audio visual Integration				0	1	2
25	Rhythm tapping test A (Reproduction)				0	1	2
26	Rhythm tapping test B (Production)				0	1	2

NEUROLOGICAL SIGNS SCORING SHEET-II

	Case/ Control No.:							
ITEMS:								
SENSORY INTEGRATION								
	Audio Visual Intergation							
	Steriognosis							
	Right							
	Left							
	Graphesthesia							
	Right							
	Left							
	Extinction							
	R/L Confusion							
MOTOR CO- ORDINATION								
	Tandem walk							
	Rapid alternating Movements							
	Right							
	Left							
	Finger thumb opposition							
	Right							
	Left							
	Finger - Nose test							
	Right							
	Left							
SEQUENCING OF COMPLEX								
MOTOR ACTS								
	Fist - ring							
	Right							
	Left							
	Fist- edge - palm							
	Right							
	Left							
	Ozeretski							
	Rhythm tapping B							
OTHERS								
	Adventitious overflow							
	Right							

	Left							
Romberg								
Treumor								
	Right							
	Left							
Memory								
5 min								
10 min								
Rhythm tapping A								
mirror movements								
	Right							
	Left							
Synkinesis								
	Right							
	Left							
Convergence								
	Right							
	Left							
Gaze Impersistence								
	Right							
	Left							
Glabellar reflex								
Snout reflex								
Grasp reflex								
	Right							
	Left							
Suck reflex								